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STATE OF VERMONT
PUBLIC SERVICE BOARD

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DOCKET NUMBER 6812

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PETITION OF ENTERGY NUCLEAR VERMONT YANKEE, LLC
AND ENTERGY NUCLEAR OPERATIONS, INC., FOR A
CERTIFICATE OF PUBLIC GOOD TO MODIFY CERTAIN
GENERATION FACILITIES AT THE VERMONT YANKEE
NUCLEAR POWER STATION IN ORDER TO INCREASE THE
STATION'S GENERATION OUTPUT.

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September 17, 2003
9 a.m.

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112 State Street
Montpelier, Vermont

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Technical Hearing held before Board Members of
the Vermont Public Service Board, at the Third Floor
Conference Room, Chittenden Bank Building, 112 State
Street, Montpelier, Vermont, on September 17, 2003,
beginning at approximately 9 a.m..

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P R E S E N T

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BOARD MEMBERS: Michael H. Dworkin, Chairman
David C. Coen
John D. Burke

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0004

1 BOARD MEMBER COEN: Good morning.

2 MR. FRANKLIN: Good morning.

3 MS. HOFMANN: Good morning.

4 BOARD MEMBER BURKE: We are going to
5 move him later.

6 BOARD MEMBER COEN: Move you. Okay.
7 Any preliminary matters before we begin? My
8 understanding, Ms. Hofmann, is that you're
9 done with your cross examination of Mr.
10 Greene?

11 MS. HOFMANN: That is correct.

12 BOARD MEMBER COEN: Mr. Greene, would
13 you come back up here. Mr. Shadis, are you
14 ready?

15 MR. SHADIS: Yes, sir. Just about.

16 BOARD MEMBER COEN: I understand you had
17 a bit of regulation this morning. We'll be
18 kinder to you.

19 MR. SHADIS: Very professional. Last
20 time I saw that degree of professionalism was
21 when I visited my proctologist.

22 BOARD MEMBER COEN: Here I thought you
23 saw professionalism here, Mr. Shadis.

24 MR. SHADIS: Well different means of
25 administering.

0005

1 BOARD MEMBER BURKE: We would be a poor
2 substitute for your proctologist.

3 MR. SHADIS: Maybe we ought to drop that
4 analogy.

5 A N D R E W G . G R E E N E ,

6 Having been previously duly sworn, was
7 examined and testified as follows:

8 CROSS EXAMINATION

9 BY MR. SHADIS:

10 Q. Good morning, Mr. Greene.

11 A. Good morning, Mr. Shadis.

12 Q. Looking at your prefiled rebuttal testimony
13 and, let's see where we go here, yes, on page 17 please
14 line 7 you have table 5, cost of a severe accident. I may
15 have missed a footnote or something, but could you please
16 tell me where that table came from?

17 A. The table was produced from data that I was
18 supplied by Dr. Burns. I had asked Dr. Burns to provide
19 information regarding costs associated with a CDF and LERF
20 which he provided from the filing that's reflected here in
21 the table.

22 This, as I understand it, is relating to an
23 environmental assessment that was performed for the Quad
24 Cities facility.

25 Q. I'm wondering why -- why you have included

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1 this in your testimony given that Mr. Burns isn't here to
2 verify this information and there's no citation for it.
3 This is a basically a core fan assertion. Did you -- did
4 you want to assume responsibility for these calculations
5 or how do you think we should approach that?

6 A. To give you a little bit more specific
7 citation for the source of the data, this information is
8 again provided by Dr. Burns, but its source is from the
9 Quad Cities license renewal application appendix F, severe
10 accident mitigation alternatives, and that's described on
11 the bottom of the text on page 16 into the top of page 17.

12 MR. SHADIS: As you probably know from
13 observing the hearings for the last few days
14 I'm not an attorney, but this looks like
15 hearsay to me and it looks like information
16 that we have no way of verifying, and I guess
17 I would like the Board to weigh this
18 information for what it's worth on that basis.

19 MR. FRANKLIN: I just want to note that
20 the evidence is -- this has been stipulated to
21 previously and it's long overdue any time to
22 object to what's contained herein.

23 BOARD MEMBER COEN: That's correct.

24 MR. SHADIS: I'm not objecting to it.
25 I'm asking the Board weigh it.

0007

1 BOARD MEMBER COEN: The Board weighs all
2 the evidence for what it's worth, Mr. Shadis.

3 MR. FRANKLIN: I would object for it
4 being simply argumentative for the witness.

5 BOARD MEMBER COEN: Want to continue
6 please.

7 MR. SHADIS: I want to know whether that
8 objection is sustained or not. I don't think
9 it's being argumentative at all. I just want
10 to know where this comes from and get some
11 idea of what its worth is.

12 BOARD MEMBER COEN: Objection is
13 overruled. Would you continue please.

14 MR. SHADIS: Thank you, sir.

15 BY MR. SHADIS:

16 Q. Could you tell me why you didn't consider
17 information, the same numbers if you will, from Vermont
18 Yankee?

19 A. Again based on my consultation with Dr. Burns
20 I did ask if there were any information specific to
21 Vermont Yankee, excuse me, that provided financial
22 estimates of the core damage frequency event or large
23 early release event. Dr. Burns indicated to me that
24 because these values are typically developed during the
25 course of a relicensing application, and since the Vermont

0008

1 Yankee facility has not submitted a relicensing
2 application, I did not have a comparable value to use in
3 this calculation.

4 Q. I see. Are you aware of a U.S. Nuclear

5 Regulatory Commission document titled CRAC 2?
6 A. I can't say that I am, no.
7 Q. Issued in 1982?
8 A. I am not aware of that.
9 Q. So then you would be unaware that that
10 document contains the same information for Vermont Yankee
11 applicable to Vermont Yankee?
12 A. That is correct.
13 Q. I would like to turn to the subject of your
14 carbon offset. I have one, two documents that I would
15 like to show you and I would like to enter into evidence
16 as cross examination documents NEC exhibit AGS 20 and NEC
17 exhibit AGS 19. If I may approach, I'll produce these to
18 the witness.
19 BOARD MEMBER COEN: You are moving their
20 admittance at this time?
21 MR. SHADIS: Yes, sir.
22 BOARD MEMBER COEN: Is there any
23 objection to that?
24 MR. FRANKLIN: May I check for a moment
25 please? I believe there is. Talking about 19
0009
1 and 20.
2 Yes, I would object to these as
3 certainly I don't know that my witness has any
4 personal knowledge of these documents. These
5 are essentially hearsay documents and to the
6 extent that he can provide some personal
7 knowledge about them or authenticate them in
8 some way, then I think he can certainly try,
9 but at this time I would object.
10 I would also note these documents were
11 not contained in Mr. Gundersen's prefiled
12 testimony and they weren't even submitted at
13 the same time as his testimony that came
14 approximately ten days later I believe.
15 BOARD MEMBER BURKE: Before we rule on
16 this it might be helpful if Mr. Shadis showed
17 at least the documents to the witness to
18 determine whether or not he can authenticate
19 them or has knowledge. Has he got them?
20 MR. FRANKLIN: I believe he has a copy
21 of them, and so if he can get them in through
22 the witness I think that's fine.
23 BOARD MEMBER BURKE: Before we rule on
24 the objection I think there's a question that
25 ought to be asked so Mr. Shadis.
0010
1 BY MR. SHADIS:
2 Q. Have you had an opportunity to review these
3 documents?
4 A. I have glanced through them, yes.
5 Q. Are you first familiar with the subject matter
6 of these documents?
7 A. I believe the article from the Courier Journal
8 looks at the upstream emissions in the nuclear fuel cycle
9 relating to the enrichment process at the Paducah Kentucky

10 facility. I'm certainly aware of the concerns about
11 emissions from the upstream aspect of the fuel cycle.
12 Q. And are you aware of the proportional
13 anthropogenic contributions to greenhouse gasses that is
14 included in the second document?
15 A. I've seen a number of different breakdowns of
16 this sort, a pie chart if you will, that described
17 different greenhouse gas emission sources. I'm looking to
18 see the source of this information.
19 MR. SHADIS: Thank you. I think that
20 that in essence serves the purpose of these
21 documents. We wanted to establish that
22 witness Greene was aware of these particular
23 considerations.
24 BOARD MEMBER COEN: Are you continuing
25 to move the admission of these documents?
0011
1 MR. SHADIS: Yes, sir.
2 MR. FRANKLIN: Then I would continue to
3 object. The subject matter is one thing. The
4 particulars of the document are something
5 different.
6 BOARD MEMBER COEN: Excuse me one
7 second. Can we have copies of those
8 documents?
9 MR. SHADIS: Certainly. These were
10 actually provided as exhibits.
11 BOARD MEMBER BURKE: Are they part of
12 what were Mr. Gundersen's exhibits?
13 MR. SHADIS: Yes, sir.
14 BOARD MEMBER COEN: Okay. We may have
15 them. 19 and 20?
16 MR. SHADIS: Yes, sir.
17 BOARD MEMBER COEN: I've got them. I've
18 got my copy. Thank you.
19 BOARD MEMBER BURKE: Before we rule on
20 this could I ask this was a packet that was
21 dated September 5, 2003 that I have in front
22 of me. I show receipt by the Board on
23 September 9th.
24 MR. SHADIS: That's correct.
25 BOARD MEMBER BURKE: Let me ask those
0012
1 are both correct dates as far as you know, Mr.
2 Shadis?
3 MR. SHADIS: Yes.
4 BOARD MEMBER BURKE: Mr. Franklin, when
5 did Entergy receive these documents?
6 MR. FRANKLIN: I think it was last
7 Tuesday which I believe is the 9th.
8 BOARD MEMBER COEN: The 9th.
9 MS. HOFMANN: The Department's copy is
10 date stamped we got it September 9th.
11 BOARD MEMBER COEN: Tuesday was the 9th.
12 Thursday was the 11th. Mr. Franklin.
13 BOARD MEMBER BURKE: Before we actually
14 rule on this, Mr. Greene, with regard to the

15 chart that is marked as exhibit 20 -- pardon
16 me I'm without my glasses. With them I can't
17 see. With them I can't see. Justice is
18 blind. Does that appear to be reasonably
19 representative of the subject matter?

20 MR. GREENE: I'm concerned about the
21 specific sizes of this license in this pie
22 chart. My recollection of similar
23 contribution assessments is different than
24 what I'm seeing here on this page and I would
25 certainly want to take a closer look at it.

0013

1 Again the types of contributions are
2 similar, but the proportional responsibilities
3 may be different.

4 BOARD MEMBER COEN: We are not going to
5 admit these documents at this time. You
6 certainly are free to try to readmit them
7 under Mr. Gundersen.

8 MR. SHADIS: Thank you.

9 BY MR. SHADIS:

10 Q. May I ask, sir, in your calculation of
11 environmental impacts did you take into consideration the
12 environmental impacts of the entire nuclear fuel cycle?

13 A. Yes, I did.

14 Q. And what was your estimate of the
15 environmental impact of the fuel enrichment process? I
16 know it would be a great deal of detail, but in broad
17 brush terms.

18 A. My consideration of the implications of the
19 enrichment process appears on table 4 which shows life
20 cycle emissions of nuclear and other energy technologies.
21 That's on page 15 of my rebuttal testimony.

22 The nature of the life cycle emissions
23 calculation is to look not just at the plant level such as
24 a smokestack for a coal or oil burning plant, but the
25 entire fuel chain from mining, extraction, production,

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1 transportation, energy production, and ultimately
2 decommissioning of the facilities.

3 This table -- by the way the site is on the
4 bottom of the table. It's from a publication issued by
5 the International Energy Agency which is an affiliated
6 organization with the Organization for Economic
7 Cooperation and Development OECD, and this table shows
8 what the relative emissions are of nuclear and other
9 technologies looking at greenhouse gas emissions, which
10 certainly in theory would include the type of emissions
11 that would stem from the enrichment process, and the
12 numbers on this table speak for themselves, but if you
13 compare for example the range of greenhouse gas emissions
14 for nuclear to the other energy technologies, the range is
15 comparable to some of the other widely regarded
16 non-emitting technologies such as hydro power. In fact,
17 is even less than some of the renewable technologies such
18 as wind, which I presume reflects the energy intensity of
19 manufacturing wind turbines and other construction related

20 energy uses.

21 So this type of information was presented so
22 that my calculations which did look at the plant level
23 ultimately in quantifying tons avoided and dollars
24 associated with those tons is here to not be unmindful of
25 the upstream implications of the nuclear fuel cycle.

0015

1 Q. Thank you. I would ask that you restrict your
2 comments to answering the questions because we do have
3 some economies of time considered here, and I want will
4 you please, if you would, to tell me what comprises
5 greenhouse gasses, and I'm just presuming here from the
6 table this would be exclusive of the other lines in this
7 table. So it would be exclusive of SO2 emissions and OX
8 emissions, and NNVOC emissions and particulate matter. So
9 aside from them could you tell me briefly in your expert
10 opinion what it is that constitutes greenhouse gasses?

11 A. Carbon dioxide would be the primary greenhouse
12 gas. CFCs would also be another greenhouse gas as is
13 methane, and there are other constituents as well to a
14 lesser degree.

15 Q. How does CFCs affect the -- how do CFCs affect
16 the greenhouse effect?

17 A. The definition of a greenhouse gas is that it
18 has a heat trapping physical characteristic that is
19 assumed to have resulted in some type of a warming of the
20 earth. Different gasses are generally described in carbon
21 dioxide equivalent terms and different gasses have
22 different CO2 equivalencies. CFCs are considered a potent
23 greenhouse gas emission, many times greenhouse gas warming
24 potential of CO2, but it's a heat trapping mechanism
25 that's ultimately what makes it a greenhouse gas.

0016

1 Q. You're sure of that?

2 A. That's my understanding.

3 Q. What proportion of the greenhouse gasses as
4 you have termed them greenhouse gasses, what proportion
5 does CFCs comprise?

6 A. I can't cite a particular figure for you here
7 without checking records and giving you a specific number.
8 It is certainly a minority of the global warming potential
9 gasses emitted, whether anthropogenic or
10 non-anthropogenic.

11 Q. Could you ball park it? Would it be more or
12 less than ten percent?

13 A. Subject to check I would say it's probably
14 somewhere in the vicinity of ten percent, but I am not
15 capable of giving you a point estimate without reviewing
16 records.

17 Q. I see. So your posit then, your statement is
18 that this figure for greenhouse gas emissions in grams per
19 kilowatthour, I presume that's what that is, includes the
20 CFCs?

21 A. It may. I can't tell you specifically whether
22 it does or not without reviewing the additional
23 calculations in the document.

24 Q. Now see I misunderstood because I thought

25 earlier that you had included CFCs in greenhouse gasses?

0017

1 A. CFCs are in fact a greenhouse gas, and the
2 column title which is taken from the report that's cited
3 here in concept could and should include CFCs.

4 Q. Did you anywhere in your testimony or in
5 preparing your testimony take into consideration any
6 effects of CFCs from the nuclear fuel cycle other than
7 this idea of CFCs as a greenhouse gas, a heat trapping
8 gas?

9 A. I do refer generally to some other life cycle
10 assessment studies that I have looked at in the past that
11 again try to take account of the fuel cycle emissions.
12 For example, the ExternE report that was prepared for or
13 by the European commission. Very comprehensive report
14 that looks at again the life cycle perspective.

15 Sitting here I can't tell you for sure whether
16 that includes CFCs or not, but the study is very thorough
17 and comprehensive and I would imagine that it does.

18 Q. I see. And would you recommend that the State
19 of Vermont make decisions respecting regulation based on
20 your suppositions? I withdraw that. That's really
21 unkind. It's really a supposition. It doesn't cut it.

22 Can you characterize the effects of CFC 114?

23 A. As I mentioned in my previous response to your
24 question, it is a greenhouse gas with a high global
25 warming potential relative to carbon dioxide.

0018

1 Q. I see. And does it have an effect on the
2 ozone layer?

3 A. It does.

4 Q. And what is the largest source of CFC 114 in
5 the United States?

6 A. I'm not sure I can give you an exact answer,
7 an entirely accurate answer to the question, but certainly
8 CFCs are widely understood and associated with
9 refrigeration and air conditioning systems as one example,
10 in the manufacture of various industrial products, foams
11 and other materials of that sort. I think your answer
12 would require a bit more research on my part.

13 Q. Sure. Could you describe a process in which
14 uranium hexafluoride is a component?

15 A. I'm not able to give you a specific answer
16 with regard to uranium hexafluoride.

17 Q. I see. Would you be able to comment on the
18 contribution of CFCs to the environment from the nuclear
19 fuel cycle?

20 A. Other than the testimony that considers
21 nuclear fuel cycle relative to other energy fuel cycles,
22 no.

23 Q. I see, and let's just be clear that that
24 testimony does not mention CFCs per se?

25 A. That is correct.

0019

1 Q. I see. One last question with respect to CFCs
2 and the ozone layer. What is the effect of a reduction in
3 the ozone layer?

4 A. My understanding is that thinning of the ozone
5 layer is associated with additional ultraviolet exposure
6 of the ecosystem.

7 Q. Which would mean what?

8 A. There are a variety of effects associated with
9 ultraviolet radiation.

10 Q. Would skin cancer be one of those effects?

11 A. That is one that I have noted.

12 Q. How about blindness in a number of animal
13 species of the polar regions, would that be an effect?

14 A. It may be. I am not prepared to cite the all
15 inclusive list of health effects associated with
16 ultraviolet radiation.

17 Q. And so then I would presume therefore, and
18 tell me if I'm wrong, that you would not be prepared to
19 assign a cost to a depletion of the ozone layer?

20 A. My calculations have not attempted to assign
21 a cost of ozone depletion relative to the nuclear fuel
22 cycle or any of the other fuel cycles. I have not done
23 that. That's not to say that I would not be willing to do
24 that calculation.

25 Q. Well perhaps you will get a chance. Let's
0020

1 just for a moment consider the CO2 offset. Do -- your CO2
2 offset numbers are -- I've marked it out now I have lost
3 the place in your testimony. Can you refer us to the
4 section in your testimony where you include CO2 offset
5 numbers?

6 A. Yes. Page six of my rebuttal testimony.

7 Q. Thank you. Appreciate that. Can you
8 characterize the offsets, you have them listed here, sir,
9 as tons per year of various pollutants. Can you
10 characterize these for us in terms of percentages of those
11 pollutants produced in New England?

12 A. I'll give it -- I'll make an attempt here. I
13 haven't actually done that calculation, but I can try to
14 respond to it. I believe the uprate itself produces
15 energy that's roughly equivalent to approximately .7
16 percent of New England energy production and load.

17 Q. .7?

18 A. Percent.

19 Q. Percent?

20 A. Of New England. Actually I think that's of
21 New England load requirements which is roughly equal to
22 generation in New England.

23 Q. I see.

24 A. In terms of megawatthours.

25 Q. Before you proceed with that we had that
0021

1 question with Dr. Lesser also and I was -- in any case I
2 was uncertain what is that? Did you term it New England
3 load or capacity or demand? Would it be demand?

4 A. Demand or load in megawatthours.

5 Q. Okay, and megawatthours and what would that
6 be?

7 A. Approximately 125 million megawatthours.

8 Q. And the number you are using for the output is

9 883,000 megawatthours per year?

10 A. That's correct.

11 Q. In terms of full capacity, not in terms of

12 production over hours, what is the available capacity in

13 New England? Is that -- I'm -- am I not using a correct

14 term?

15 A. I'm not sure I understand the specific

16 question.

17 Q. I want to know how much electricity is

18 available in New England? How much capacity do we have in

19 terms of megawatts not megawatthours?

20 A. I think the number is probably in the ball

21 park of about 35,000 megawatts for New England.

22 Q. I see.

23 A. Actually I'm sorry. It would probably be

24 greater than that because the peak load is probably in

25 the, if I remember correctly, 32 or 33,000 megawatt range

0022

1 and there is a reserve margin built into the system.

2 Q. I'm sorry to interrupt you.

3 A. So the amount of capacity that's available

4 would perhaps be between 35, 40,000 megawatts. That's a

5 recollection on my part. Certainly subject to check if

6 you need a precise answer.

7 Q. So there was some commotion here and I just

8 missed your last portion of your last sentence. Let's be

9 clear. Initially you said there would be -- there's about

10 35,000 megawatts of power available in New England,

11 capacity, and then your figure for the demand was what,

12 sir?

13 A. Approximately 125 million megawatthours

14 annually.

15 Q. Okay. But that demand -- can that demand be

16 expressed in terms of megawatts not megawatthours?

17 A. It can certainly be.

18 Q. For example, peak demand in New England is

19 what?

20 BOARD MEMBER COEN: Excuse me, Mr.

21 Shadis. I just want the record to note the

22 Chairman has arrived. He will be reading the

23 transcript with interest. Continue please.

24 A. The recent peak demand figures that I can

25 recollect are somewhere in the low 30,000 megawatt range

0023

1 summer peak.

2 Q. 35,000?

3 A. Low 30,000.

4 Q. Low 30?

5 A. I don't believe it's as high as 35,000

6 megawatts.

7 Q. Okay. So low 30. Okay. In calculating the

8 impact of the uprate could you take -- were these numbers

9 the numbers that informed your calculation as to the

10 effect or the impact of the uprate?

11 A. I did not rely on absolute capacity of the New

12 England generation mix. I was looking at the energy

13 contribution of the uprate relative to demand in New

14 England, which as I mentioned was the .7 percent figure,
15 using the 883,000 megawatthour assumed production from the
16 uprate.

17 Q. I see.

18 A. Megawatthours are much more relevant in terms
19 of looking at environmental benefits than megawatts.

20 Q. Thank you. Appreciate that. Did you do any
21 calculation at all for the service area of the grid? In
22 other words, did you do any calculation at all respecting
23 those areas or including those areas to which power might
24 go outside of New England from the uprate?

25 A. Not specifically.

0024

1 Q. In the table two, which is on page 7 of your
2 testimony, did you include in any of these health effects,
3 health effects from the depletion of the ozone layer?

4 A. The data presented in table two were not
5 calculated, or at least in the first data column not
6 calculated by myself. This data is culled from the report
7 that's cited in footnote number two at the bottom of the
8 page. I used that data to extrapolate the potential
9 benefits of the Vermont Yankee uprate in the second data
10 column to the right.

11 Q. I see, and how did you integrate causation in
12 your calculation?

13 A. The report prepared by the clean air task
14 force associates production from fossil generation
15 facilities with various health consequences using a
16 variety of different health data, and again using energy
17 production as a proxy for emissions my calculation in the
18 column to the right of the table is an extrapolation from
19 the clean air task force methodology.

20 Q. So if I understand correctly what you're
21 positing in this table is substituting a 110 megawatt
22 electric fossil fuel plant for the 110 megawatts
23 anticipated in this proposed extended power uprate; is
24 that correct?

25 A. That would be a reasonable characterization I

0025

1 think of the approach that I have taken.

2 Q. Okay. What would be your best
3 characterization of your approach?

4 A. Again the report itself, the clean air task
5 force report, associates the emissions from electric
6 generation facilities that burn fossil fuels with
7 premature deaths, hospitalizations, lost work days, et
8 cetera. I used the proportion of the Vermont Yankee
9 uprate energy output as a percentage of the total New
10 England load to extrapolate the figures in the clean air
11 task force report.

12 Q. But okay. Your table is specific to
13 Vermonters. How did you determine -- well first off did
14 you determine a location for this hypothetical fossil fuel
15 plant? Where is that fossil fuel plant?

16 A. There's no specific location implied by my
17 calculation as to where the avoided fossil fuel unit is.
18 Inherent in the approach that I've taken is that somewhere

19 within the New England region the uprate will be avoiding
20 air emissions, although I would add because we are
21 interconnected with other grids in New York, in Canada,
22 that the avoided emissions could certainly be from a
23 broader geography in which case I would probably need to
24 include the avoided health consequences in those other
25 regions which I did not do. The clean air task force

0026

1 report did actually cite state specific health
2 consequences from fossil generation facilities.

3 Q. I see. I asked the question because this is
4 so very specific to Vermonters and would you not agree
5 that location with respect to population, location with
6 respect to prevailing wind would have an effect on these
7 numbers?

8 A. Yes, it would.

9 Q. And would it in your estimation have an effect
10 in the order of a few percent, 10 percent, 50, 100
11 percent? Where would you strike some kind of estimation
12 as to the effect that the location of such a fossil fuel
13 plant would have?

14 A. I would say location is a very significant
15 factor.

16 Q. Significant. Could you put a number on
17 significant?

18 A. I really can't put a number, but I again would
19 state that the results would certainly be significantly
20 affected by the location of the avoided emission as well
21 as the nature of the emissions being avoided.

22 Q. So in a hypothetical situation if you were to
23 locate a fossil fuel plant on the eastern border of
24 Vermont and your winds were prevailing out of the west,
25 the effect would largely then fall upon New Hampshireans,

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1 would it not?

2 A. It would.

3 Q. So then the table would only apply if it were
4 Vermonters downwind of this particular power plant; is
5 that correct?

6 A. I would agree with that.

7 Q. Would you recommend to this Board that if a
8 decision is cast to substitute a fossil fuel plant for the
9 uprate that the plant not be located on the western border
10 of Vermont? I'm just being facetious. I'm sorry.

11 I would like to progress now to the answer to
12 question 13. That would be page 8 of your testimony. Are
13 we there, sir?

14 A. Yes, I am.

15 Q. You characterize this use of diluted nuclear
16 fuel as a non-proliferation initiative and this is cited,
17 if I understand correctly, as a societal or environmental
18 benefit to the uprate; is that correct?

19 A. That is correct.

20 Q. Did you take into consideration any other
21 means of dealing with weapons grade uranium for the
22 purposes of non-proliferation?

23 A. No, I didn't consider alternatives.

24 Q. Do you know of any alternatives?
25 A. For reuse of the nuclear material?
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1 Q. Sir, to eliminate the risk of proliferation in
2 order to foster non-proliferation?
3 A. I have no specific knowledge about alternative
4 means of otherwise using or storing spent nuclear warhead
5 material.
6 Q. Only -- I'm sorry to belabor the point, but
7 only to make it non-available for proliferation, but I
8 presume that your answer would cover that also, making it
9 non-available?
10 A. I did not look at alternatives to this
11 approach.
12 Q. Okay. And I think the question has been asked
13 and answered with respect to whether or not Vermont
14 Yankee's got a contract, intends to do it or will ever
15 come close to it. Did you in this consideration in the
16 use of highly enriched uranium also consider the use of
17 mixed oxide fuel?
18 A. No, I did not.
19 Q. Can you define mixed oxide fuel?
20 A. Not specifically.
21 Q. Generally?
22 A. I'm not prepared to do that today.
23 Q. Sure. Thank you. Would you please now turn
24 to page 11 of your testimony? Other than -- we are
25 looking at the answer here to question 17. Other than
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1 repeating what witnesses have already testified to in this
2 proceeding, do you have any other source for your
3 assertions regarding 3.6 millirem as the dose addition due
4 to uprate?
5 A. I don't. I have not performed any
6 calculations to supplement the information provided by
7 other witnesses in the case.
8 Q. I see. Yesterday -- were you here yesterday,
9 for the testimony yesterday?
10 A. Yes, I was.
11 Q. Do you recall questions regarding the
12 replacement of the turbine internals? If I may try to
13 refresh your memory on that, the questions were I believe
14 to Mr. Yasi and had to do with whether or not calculations
15 for dose were complete with respect to the contribution
16 that might be made with new turbine internals. Does that
17 --
18 A. I may not have been in the room during that
19 cross examination.
20 Q. I see. I see. So then I -- just following on
21 that you wouldn't be able to comment on whether or not a
22 change in the turbine internals, the volume and mass of
23 the turbine internals, would contribute to this 3.6
24 millirem estimate?
25 A. No, I would not.
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1 Q. Thank you. If you will turn please to page 12
2 of your testimony, to your knowledge has the Department of

3 Energy contributed any money to the storage of waste at
4 closed nuclear facilities? And by nuclear facilities let
5 me make that more specific. At closed nuclear power
6 stations.

7 A. I'm not aware of whether they have or have
8 not.

9 Q. Do you have any estimate of the cost of
10 storing nuclear fuel at closed nuclear power stations?

11 A. No, I don't.

12 Q. Do you have any estimate of the cost of
13 storing nuclear fuel in dry cask storage at operating
14 nuclear power stations?

15 A. Very rough knowledge of those costs.

16 Q. Could you follow-on that please and just give
17 us a little more information about your rough knowledge of
18 those costs?

19 MR. FRANKLIN: I would just like to make
20 sure the record is clear we are talking about
21 costs to the operator or costs to outside.

22 CHAIRMAN DWORKIN: Mr. Franklin, it's an
23 expert witness. He's been very careful in his
24 answers. I'm sure that he will draw that kind
25 of line if he thinks it's important to his

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1 response.

2 A. I don't hold myself as an expert on dry cask
3 storage or nuclear fuel storage in general. I have come
4 across numbers in trade publications suggesting millions
5 of dollars associated with dry cask storage. I can't give
6 you a more specific estimate than that.

7 Q. The question, question 18, sir, mentions
8 societal cost that should be factored into the benefit
9 cost test, and your reference basically goes to the
10 Department of Energy and the amount of money that they
11 have collected to offset this cost, and that's why I asked
12 that question about the Department of Energy contribution
13 to waste storage at nuclear facilities like Vermont
14 Yankee, for example.

15 On the topic of the costs and benefits of
16 waste storage can you characterize for us the increased
17 waste storage requirements that will result from the
18 extended power uprate?

19 A. I haven't looked at that specifically, but my
20 understanding generally from materials prepared in the
21 case that the uprate is fairly proportional to the amount
22 of additional power generation. So a 20 percent increase
23 in output of this facility generally and approximately
24 would correspond with a 20 percent increase in waste
25 output. I can't be much more specific than that.

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1 Q. I see. In your estimation and would the costs
2 associated with that be insignificant? I'm talking dollar
3 costs.

4 A. No I wouldn't say the costs are insignificant,
5 but I would say the costs are not externalities because of
6 the application of the 1983 Nuclear Waste Policy Act which
7 levies a fee for megawatthours generated at nuclear

8 facilities to fund ultimate waste storage at a repository
9 such as Yucca Mountain. So it is a cost. It is
10 potentially significant. Close to potentially a million
11 dollars a year assuming you know 883 megawatthours
12 annually of uprate production, but it is a cost that is
13 internal in the process and ultimately not societal cost.

14 Q. Do you have any idea of what Vermont Yankee's
15 place might be in the Department of Energy's spent fuel
16 acceptance and removal schedule?

17 A. I don't have an answer to that question.

18 CHAIRMAN DWORKIN: Mr. Greene, I want to
19 follow up on your statement these costs are
20 not externalities. I understand that many
21 utilities and power plant operators are paying
22 into the fund for Yucca, but is it not also
23 true that despite having paid into that fund
24 many are also in addition incurring costs for
25 storage?

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1 MR. GREENE: I believe that's true and
2 that would be -- if the generator is incurring
3 the cost to store spent fuel, that presumably
4 shows up in their production costs.

5 CHAIRMAN DWORKIN: And are there any
6 governmental, whether it's municipal, state or
7 federal, costs associated with storage that
8 are above and beyond the costs for Yucca?

9 MR. GREENE: Regulatory oversight would
10 come to mind as a cost to governmental
11 agencies in monitoring, supervising the waste
12 issues associated with power plant.

13 CHAIRMAN DWORKIN: Go on, Mr. Shadis.

14 BY MR. SHADIS:

15 Q. Thank you and thank you for that summation.
16 Can you characterize, or characterize may be the wrong
17 word, can you give us a ball park idea of how much nuclear
18 waste will be generated through the extended -- solely as
19 a result of the extended power uprate?

20 A. I can't give you a physical quantity, but as I
21 mentioned before I believe it would be an approximately 20
22 percent increase relative to the existing waste generation
23 levels.

24 Q. Are you aware of any figures regarding the
25 value of waste storage and I may be not using a really

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1 good term by saying the value of waste storage, but are
2 you aware of any dollar figures assigned to waste storage
3 by any state in the union?

4 A. Are you talking about onsite storage or
5 offsite storage?

6 Q. Well, yes, sir, I'm talking about onsite
7 storage, and as you may know from reading the documents in
8 this case the plan here is to eventually go to dry cask
9 storage and store additional canisters of fuel here. Do
10 you have any notion of what kinds of costs or values, tax
11 values or anything else that have been assigned to that
12 kind of storage around the country?

13 A. I don't have a specific figure, but generally
14 I am aware that the nuclear industry collectively is not
15 happy about the lack of long term storage repository
16 capability, for example, at Yucca Mountain and there is a
17 lawsuit pending against the Department of Energy for
18 failure to meet its obligations under various pieces of
19 legislation.

20 Q. So you're not aware of any municipal tax
21 assessments against dry cask storage or calculations
22 regarding the costs of dry cask storage to a community
23 that may have been done by any governmental body anywhere
24 in the United States?

25 A. I'm not specifically aware of any such

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1 assessments.

2 Q. Okay. Thank you. I have -- I want to
3 backtrack just a moment. Excuse me again for the
4 confusion, but in terms of the -- of the CO2 or greenhouse
5 gas offset, could you estimate a percentage offset for the
6 United States in terms of greenhouse gas, and if you would
7 please from electric power generation? I ask that and
8 I'll explain and then it may give you time to think about
9 the answer.

10 What I'm looking for here is based on the
11 notion that this electricity, now that the grids are so
12 much further interconnected, this electricity may wind up
13 in Ohio or Illinois or somewhere, God only knows, so
14 beyond New England what would the offset be for the
15 country as far as electric generation? Could you ball
16 park that?

17 A. Well the offset would still be 615,840 tons
18 according to the calculation on page six of my testimony.
19 In terms of what percentage that is relative to emissions
20 from the generation industry throughout the country I
21 don't have a specific figure to offer today.

22 Q. Do you have -- do you have an idea -- can you
23 give us an idea of what the generating capacity in the
24 United States is, electric generating capacity in the
25 United States?

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1 A. Somewhere north of 500 gigawatts.

2 Q. And the 110 megawatts would be somewhere,
3 where in the 10 to the minus sixth percentage of that?

4 A. It is certainly a decimal point if one were to
5 assume that there was a correlation between megawatts and
6 avoided greenhouse gas emissions. It does overlook the
7 need to consider energy production as the primary vehicle
8 for avoiding greenhouse gas emissions.

9 Q. Would you agree the contribution to the
10 nation's electric supply would certainly be miniscule?
11 I'm speaking of the contribution from the uprate.

12 A. It is a very small percentage of the
13 generation in the country. No question about that.

14 Q. And the offset also would be miniscule?

15 A. It is -- I would not want to characterize it
16 as miniscule because certainly every ton of reduced
17 greenhouse gas emission is important not just for the

18 United States but globally.
19 Q. Proportionally miniscule?
20 A. It is very small.
21 Q. And would you also be willing to characterize
22 the offset for New England as tiny?
23 A. If it were again approximately equivalent to
24 the proportion of energy production and load in New
25 England, I would not regard a .7 percent reduction of CO2
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1 emissions from the electric generation sector as
2 miniscule, tiny, or unimportant. I think given the
3 commitments of the New England states to reduce greenhouse
4 gas emissions, as well as our counterparts in the Canadian
5 provinces, it would be very important and significant to
6 achieve these reductions.
7 Q. I think we are getting pretty close to the end
8 here. I guess we are at the end. I think that completes
9 my questions to you. Thank you.
10 CHAIRMAN DWORKIN: Any questions?
11 MR. MATTEAU: Yes. Thank you.
12 CROSS EXAMINATION
13 BY MR. MATTEAU:
14 Q. Good morning.
15 A. Good morning.
16 Q. I'm the Director of the Windham Regional
17 Planning Commission.
18 CHAIRMAN DWORKIN: Before you launch in
19 let me just ask ordinarily we take a break
20 somewhere close to 10:30. If you have just
21 one or two questions, we can do them. If you
22 have more, we can come back after the break.
23 MR. MATTEAU: I think we can hit 10 or
24 15. Thank you.
25 BY MR. MATTEAU:
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1 Q. When you were estimating the external costs
2 did your calculations include costs of emergency planning
3 by the state or towns?
4 A. I did not -- did not take that into account.
5 Q. Which would include emergency response
6 preparation when I use that term?
7 A. That's right.
8 Q. What about security costs?
9 A. I did not look at that as an incremental cost
10 associated with the uprate.
11 Q. Can you tell us what funds, what amounts of
12 monies ENVY pays the State of Vermont on an annual basis?
13 A. I believe there's an assessment to support the
14 low level radioactive waste in Vermont. There may be a
15 number of other assessments I can't cite specifically.
16 Q. Okay. Well would you accept that there is an
17 emergency fund that's paid to the state if I told you
18 that?
19 A. That would be consistent with my understanding
20 in other states.
21 Q. But you have no knowledge as to how much that
22 is?

23 A. I don't.
24 Q. Which I'll ask the next question anyway and
25 that is are Entergy's payments to the State of Vermont
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1 adequate to cover the costs in your opinion?
2 A. I can't offer an opinion about that.
3 Q. I want to ask this last question anyway. Are
4 there costs that are borne at the local level above and
5 beyond those that for which Entergy compensates the State
6 of Vermont?
7 A. It is certainly a theoretical possibility.
8 Without looking at the specific nature of any assessments
9 paid by Entergy relative to the costs of local
10 governmental and state agencies I couldn't tell you what
11 the balance is between the two.
12 MR. MATTEAU: Thank you. That's all.
13 Thank you.
14 CHAIRMAN DWORKIN: We'll break now. Mr.
15 Deen, do you have anything? You had reserved
16 ten minutes.
17 MR. DEEN: No.
18 CHAIRMAN DWORKIN: Why don't we see if
19 there's any redirect when we come back. We
20 may have a few questions, but most of it has
21 been covered by things that happened before.
22 (Recess.)
23 CHAIRMAN DWORKIN: Before we see about
24 questions from the bench let me just see is
25 there any last minute thoughts that occurred
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1 to you folks since the break?
2 MS. HOFMANN: I just have a
3 clarification question for him if you wouldn't
4 mind us doing that.
5 CHAIRMAN DWORKIN: Please go on.
6 MS. HOFMANN: It really is a
7 clarification.
8 BY MS. HOFMANN:
9 Q. Mr. Greene, let me show you what is not marked
10 as an exhibit and it really doesn't have to be. I just
11 want you to look at it. This is the NEPOOL 2003 - 2012
12 forecast report. Are you familiar with that?
13 A. I haven't seen I believe the latest version of
14 it, but I am familiar with these reports.
15 Q. And can I also show you a page from that which
16 is entitled Section 1 Summaries, and it has New England
17 total capacity of adjusted load, and I didn't know if you
18 would want to change your answer given what the capacity
19 is in New England? It's got the 2002 numbers and forecast
20 for 2003.
21 A. Yes. Reading line 5.3 it indicates here the
22 total capacity for New England is just a little bit over
23 32,000 rising to almost 34,000 by 2012.
24 Q. What's the load number?
25 A. The load for 2003?
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1 Q. Yes.

2 A. 26,787.
3 Q. And for 2002?
4 A. 26,176.
5 Q. And that's a little lower or lower than what
6 you had indicated from memory; is that correct?
7 A. Yes, it is.
8 Q. Thank you.
9 MS. HOFMANN: I don't have any further
10 questions for Mr. Greene.
11 CHAIRMAN DWORKIN: I'm sorry. Mr.
12 Shadis, you had a point.
13 MR. SHADIS: If I may.
14 BY MR. SHADIS:
15 Q. We are puzzled by the consideration that if
16 Vermont doesn't need the electricity that will be produced
17 through the extended power uprate why should we be
18 considering offsets?
19 A. Your question goes to what the standard of
20 review is of the Board in granting a Certificate of Public
21 Good.
22 My understanding is that for merchant
23 generation facilities such as Vermont Yankee absolute
24 market need for megawatthours is not in and of itself the
25 determinant of whether a certificate can be granted, but
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1 rather whether there are net benefits to Vermonters
2 relating to the proposed action seeking a certificate.
3 Q. Okay. So need, in other words, need is not a
4 question?
5 A. Need would certainly relate to what the market
6 value of the output is for Vermont consumers, and the
7 general nature of the market would also speak to the
8 question of what type of avoided air emissions and other
9 environmental consequences might relate to the uprate, but
10 I don't believe the company is obligated or required to
11 demonstrate quote unquote market need to obtain a
12 certificate.
13 Q. Is that in regulation or are you taking that
14 from -- what is the source of that statement?
15 A. My general understanding of the standard of
16 review for the 248 proceedings.
17 MR. SHADIS: Thank you.
18 CHAIRMAN DWORKIN: I don't think we have
19 anything from the bench. Do you have any
20 redirect?
21 MR. FRANKLIN: I do not.
22 CHAIRMAN DWORKIN: Thank you. Thank
23 you, sir. I think we can turn to the next
24 witness.
25

1 C E R T I F I C A T E

2
3
4
5 I, JoAnn Q. Carson, do hereby certify that
6 I recorded by stenographic means the technical hearing re:
7 Docket Number 6812 at the Conference Room of the Public
8 Service Board, 112 State Street, Montpelier, Vermont, on
9 September 17, 2003, beginning at approximately 9 a.m..

10 I further certify that the foregoing
11 testimony was taken by me stenographically and thereafter
12 reduced to typewriting, and the foregoing 209 pages are a
13 transcript of the stenograph notes taken by me of the
14 evidence and the proceedings, to the best of my ability.

15 I further certify that I am not related to
16 any of the parties thereto or their Counsel, and I am in no
17 way interested in the outcome of said cause.

18 Dated at Burlington, Vermont, this 19th day
19 of September, 2003.
20

21 _____
22
23 JoAnn Q. Carson
24 Registered Merit Reporter
25